Commercial Fishponds (acre)

Definition

A water impoundment constructed and managed for commercial aquaculture production.

Scope

This standard applies to impoundments that store water and are managed for commercial aquaculture purposes. It applies to all types of ponds installed or modified for commercial production of fish and other animals and plants, including those for fee harvesting on the site. It does not apply to ponds used for non-commercial aquaculture products grown for home use or recreational purposes. This standard applies to Class (a) dams having a product of storage times effective height of dam of less than $1.13 \times 10^6 m^4$ (3,000 acre ft^2) and effective height of dam less than 10.7 m (35 ft).

Purpose

To provide a favorable water environment for producing, growing, harvesting, and marketing commercial aquaculture crops to supplement natural food supplies, to control water quality, and for effective use of land, water, and related resources.

Conditions where practice applies

On land where soil conditions, climate, water resources, and topography are suitable for constructing a pond or reservoir for commercial aquaculture production that meets the following criteria and conditions:

1. Water quantity will be adequate considering evaporation, seepage, and need for water exchange.

2. Water quality will be suitable for use in aquaculture production or can be made satisfactory by suitable treatment.

3. Application of practical pond management techniques will achieve the desired level of production on a predictable basis.

4. Access to the site is available or can be constructed and maintained.

5. Provision will be made for any needed treatment of water released downstream from the pond.

6. Ponds will store the recommended depth and area of water needed for specific aquaculture products.

7. The location, design, and installation of ponds will comply with flood plain, wetland, and prime farmland regulations.

Planning considerations

The owner/operator's objectives will dictate the level of development and management to be planned. The plan must be based on the limitations and potentials of available natural resources. A thorough aquaculture resource assessment must be made to determine the feasibility of the project. The planning is complete when all practice components essential to reaching the cooperator's management objectives have been identified.

Water Quantity

1. Effects on the water budget, with emphasis on effects on volumes and rates of runoff, infiltration, evaporation, transpiration, deep percolation and ground water recharge.

2. Effects on the volume of downstream flow or aquifers that might cause undesirable environmental, social, or economic effects.

Water Quality

1. Effects on erosion and the movement of sediment, organics, and soluble and sediment-attached substances.

2. Effects on the visual quality of water resources.

3. Short-term and construction-related effects on the water resources.

4. Effects on the temperature of water discharged.

5. Effects on the movement of dissolved substances below the root zone and toward ground water.

6. Potential for redistributing toxic materials during earth moving.

Design criteria

The site must be protected from flooding, sedimentation, and contamination. The soils within the pond area, as well as those in the contributing drainage area, must be checked for residues of pesticides and other harmful chemicals if there is a possibility of contamination.

Commercial fishponds may be: (1) embankment ponds that intercept and store surface runoff water, or (2) excavated ponds that are completely enclosed by an embankment around the outer perimeter and are filled by pumping.

Embankment ponds

Earthfill dams and embankments around excavated ponds shall meet or exceed the requirements specified for Pond - 378 with the following additional requirements:

1. The minimum elevation of the top of the settled embankment shall be increased to allow for wave action. This increased allowance shall be as specified in Table 1.

Table 1.-Wave Height

Max. fetch*lgth		Wave ht	
m	ft	m	ft
≤100	≤330	0.15	0.5
100-200	330-660	0.31	1.0
200-400	660-1,320	0.46	1.5
400-1,600	1,320-5,280	0.61	2.0

*Fetch is defined as the longest uninterrupted distance traveled by wind or wave.

2. The minimum top width of the embankment shall be 4.3 m (14 ft) and 6.1 m (20 ft), respectively, where it is to be used as a one-lane or two-lane road for management purposes and is non-public.

3. Interior embankment constructed for division of water or to direct water flow for circulation shall have adequate cross section to provide for stability and function for its intended purpose.

Excavated ponds

Ponds established by excavating and constructing an embankment around their outer perimeter that excludes outside runoff shall have either an emergency spillway with a bottom width of at least 3.0 m (10 ft) or have an overflow pipe installed with sufficient capacity to remove a 10-yr/24-hr direct rainfall amount or be at least 200 mm (8 in) in diameter, whichever is larger.

The pond should be sloped to the outlet at a gradient of at least 0.06 m per 30 m (0.2 ft per 100 ft).

Orientation

Rectangular ponds shall be positioned as nearly as possible as follows:

4.0 ha (10 acres) or less - long axis in the direction of prevailing wind. More than 4.0 ha (10 acres) - long axis perpendicular to the direction of prevailing wind.

Water supply

Wells are the most desirable source of water, but any available source may be used if the quality and quantity are adequate. If water is pumped from rivers and streams or other sources where undesirable fish may be introduced, filters must be installed on the intake.

The minimum incoming water supply for adequate maintenance is considered to be 0.4 to 0.6 L/s/ha (15 to 25 gal/min/acre). However, evaporation rates, fish-loading densities, and species requirements will be used in establishing specific rates. Flow shall be measured during periods of lowest flow. The pumping and pipeline facilities shall be located to best serve the pond, taking into account accessibility for maintenance and repair; protection from overflow and flood hazards; connections to power lines or fuel sources; and future expansion. Water entering the pond shall be aerated to increase dissolved oxygen and dissipate harmful gases if needed. This can be accomplished by falling, splashing, spraying, etc. Also, incoming water shall be as far away from outlet drain as possible so that "short circuits" will be avoided.

Pipes and conduits

Pump discharge through levees shall be installed above expected high water, and provisions shall be made to prevent pump and motor vibrations being transmitted to discharge conduits.

Depth

The water depths for various species are as shown in Table 2. These values are applicable to warm climates. Additional depth is required in cold climates to prevent or minimize winterkill.

Table 2. - Water depth for various species

Species	Most desirable m(ft)	Minimum m(ft)
Channel catfish	1.2 to 1.8 (4 to 6)	[1]0.76 (2.5)
Crawfish	0.4 to 0.6 (1.5 to 2)	0.3 (1)
Minnows, other baitfish	1.2 to 1.8 (4 to 6)	0.9 (3)
Trout	[2]0.9 to 1.5 (3 to 5)	0.9 (3)

[1]Ponds used for cage culture shall have a minimum depth of 1.5 m (5 ft) where cages are located. (Minimum clearance below the cage is 0.3 m (1 ft) but as much as 0.9 m (3 ft) is preferred.)

[2]Ponds are supplied by a constant flow of water. If pond is filled only during rainy seasons, a depth of 3 to 3.7 m (10 to 12 ft) over one-fourth or more of the pond area is recommended.

Drains

The pond must have facilities for complete as well as partial drainage. Turn-down pipes, quick-release valves, bottom-water release sleeves, or other devices for water level control and pond management are to be included in the construction of the drain facility as appropriate. Ponds - 378 shall be followed for conduit design and installation of anti-seep collars.

Pond bottom

Where fish are harvested by seining, the pond bottom shall be smoothed and free of all stumps, trees, roots, and other debris. Existing channels and depressions in the pond area shall be filled and smoothed.

For ponds where crawfish are harvested by trapping, complete clearing and removal of trees, stumps, and other vegetation are not necessary unless required by state or local ordinances.

Access and safety

Provisions shall be made for access to the site as well as access for operation and maintenance. Ramps shall be located as necessary to accommodate aeration and harvesting equipment. The maximum grade for equipment access shall be 20 percent (5:1 slope). Generally, level areas or restraining barriers shall be provided to protect pumps, motors, fuel tanks, and utility poles from vehicular traffic. Appropriate safety features and devices shall be installed or made available close by to aid people who fall into the pond and to prevent such accidents.

Protection

A protective cover of vegetation shall be established on all exposed soil surfaces that have been disturbed. If soil or climatic conditions preclude the use of vegetation, other protection methods may be used. Adequate provisions must be made to protect earth surfaces from wave erosion and turbulent water at pipe inlets and outlets. Fences shall be installed as necessary to exclude livestock and unwanted traffic. Road surfaces shall be treated if necessary to prevent vehicles from cutting deep ruts or sliding into the pond. Dams and levees shall be crowned to provide positive drainage.

Operation and maintenance

A plan for operation and maintenance shall be prepared for use by those responsible for the system. This plan shall provide for inspection, operation, and maintenance of vegetation, pipes, valves, spillways, roads, and other parts of the system.

Plans and specifications

Plans and specifications for constructing commercial fishponds shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose.

NORTH CAROLINA SUPPLEMENT - 397-1

U.S. DEPARTMENT OF AGRICULTURE
Soil Conservation Service

Technical Guide
Section IV
Rev. April 1991

COMMERCIAL FISHPONDS (Acre)

Specifications Guide

Water

A dependable supply of good quality water is of primary importance and should be the first consideration in selecting sites for commercial fish ponds. Water from wells, springs, streams, or surface runoff is suitable if necessary precautions are taken.

The best quality water can be obtained from a well. Using well water reduces problems of disease, unwanted fish, flood hazard, pesticides, and turbidity. Well water will generally need to be aerated before use in order to oxygenate the water and disperse harmful gases if present. This may be done by splashing the flow over baffles or by spraying into the air. An adequate quantity of water is often difficult to obtain from this source in most areas of North Carolina.

Springs are also a good source of water but may contain undesirable fish. Spring water should be filtered. Checks must be made to be certain that flow is adequate year-round.

Streams and other surface water supplies may be used, but problems are often involved, i.e., undesirable fish, turbidity, and pollutants. Undesirable fish may be excluded by filtering the water with Saran or fiberglass screen filters, but the possibility of problems from parasites, diseases, pesticides, silt, etc., must be carefully considered. Watershed conditions must be thoroughly evaluated prior to initiation of facility development.

Soils and Topography

A soils investigation should be made to determine if the pond will hold water without excessive seepage. When possible, ponds should be located where topography is flat or nearly flat. On flat land, rectangular ponds are most practical. On sloping lands, ponds should be designed to fit the contour of the land. A determination must be made that the pond can be satisfactorily drained and that an adequate outlet is available for disposal of the water. Ponds should be located out of the flood plain or necessary precautions must be taken to eliminate flood hazard. Suitability of the soils for road construction must also be considered.

Design of Ponds

Commercial fish ponds shall meet all the standards and specifications for Pond - Code 378.

Type - Ponds of the levee or impoundment types are generally most practical. Whenever possible, the long axis of a pond should be at right angles to prevailing winds to reduce erosion caused by wave action.

Top Width - The top width of all embankments should be a minimum of ten feet. This will allow for harvesting, feeding, and maintenance equipment access to any side of the pond.

Pond Bottom - The bottom should be cleaned, shaped, and graded to eliminate stumps, roots, or pockets that would interfere with complete drainage and seining. A bottom slope of one foot per 100 feet is desirable.

Harvest Basin - The harvest (catch) basin is located at the drain pipe and is an area into which the fish will collect as the pond is drained. It should cover about 10 percent of the pond area and should be 2 to 2-1/2 feet below the surrounding area.

Water Depth - A pond should have an average depth of 5 feet with the edges not less than 2 feet. Aquatic weeds are usually controlled at 2 feet and depths over 5 feet contribute little to fish production.

Freeboard - The top of the dam should be a minimum of 2 feet above normal pool elevation but in some circumstances more freeboard will be required. (See Pond - Code 378.)

Inflow - The inflow into production ponds should be totally controlled to eliminate or reduce problems with muddy or polluted water, flooding, and undesirable fish. This can be done by diverting surface water around the pond and controlling inflow into the pond through a properly designed pipe or other structure.

Water Control Structures - Ponds should be able to be drained within 48 hours. This will help prevent crowded fish from dying from an oxygen depletion during a prolonged period of shallow water and will facilitate harvest planning. Drain pipes are necessary, but pumps may be used to speed up the drainage. The outlet pipe must be low enough to completely drain the ponds and should be screened to prevent loss of fish.

The control structure should be capable of removing water from both the top and bottom of the pond. There are several types of control structures, but the most preferable is probably the three-ring turn-down pipe. This device acts as an overflow and drain pipe and permits desired water levels to be established by turning the pipe. A sleeve device fitted over the riser

removes water from the bottom of the pond and helps prevent the build up of toxic materials. Flashboard risers can also be used for water control.

Size - Ponds can vary in size depending on factors such as topography, species to be produced, available water, etc. Larger ponds often cost less, but ponds in the two to five acre size are usually the most manageable. Bait fish are usually one to two acres in size, although larger ponds have proven successful.